

## Ordinance Recommendations for Communications Towers

In the review of the nine tower applications, ATC believes that the current Section 5-600 should be revised with the following recommendations for the health, safety and welfare of the public.

The revisions are:

### 1. Set Backs for Communications Towers from Residential Structures

The County currently has a 750' setback from a residential structure for various zoning districts. (PD-OP, GB, etc)

#### ATC Recommendation:

All Towers should be 750' from any residential structure regardless of zoning for the health and safety of the public.

### 2. Towers are to be located in the interior of the property. (Property Line Set Back)

*(3) Monopoles, General Performance Criteria (Section 5-600)*

#### ATC Recommendation:

All towers shall be 110% of the overall height of the tower from any property line.

Rationale:

***Collapse Zone: A communications tower is designed with a "Collapse" or "Weak" leg thus to have the tower to fold upon itself at failure. This failure could come from excessive wind, ice or structural overloading from antennas or equipment.***

Examples of Towers by Classification: (Lattice Self Supportive, Guyed Lattice, and monopoles)

#### **Self Supportive Lattice Towers:**

Typically for a self supportive Lattice tower it is a 1/3 and 2/3s design.

Example: 195' Self Supportive tower.

Tower is designed to collapse @ the north leg @ approximately 65' AGL. The remaining tower above 65' AGL falls from the 65' to 195' over. Thus falling approximately up to 130' away from the centerline of the tower.

### **Guyed Lattice Towers:**

These typically fail at the guy wire anchoring system, and in this case, these fall like a tree. The height of the tower is the Collapse Zone for this type of structure. To ensure safety, add 10% of the overall height to the calculation and no development should happen within this area.

Example: 300' AGL tower with failure on a set of guys will fall in the opposite direction. Add 10% = to 30'

Total Collapse Zone: 330' radius.

### **Monopole Towers:**

Typically these towers fail at the ground level. The monopole is a steel cylinder welded or bolted to a base plate that is bolted to a concrete foundation. In high winds, ice loading and over loading of the structure itself with antennas and equipment, the failure typically happens at the joint at the ground level and base plate.

Simple put, when this tower fails, it will fall like a tree.

Example:

150' monopole falls, it will fall at the base and thus the danger area would be 150' in a radius from the base.

A factor of safety of 10% is typically added for safety.

So the overall Collapse Area is  $150' + 15' = 165'$ .

### **Fall Zone:**

***This typically is an object such as an antenna, chunk of ice, equipment or tower appurtenances fall, that they may cause damage or injury to the public.***

Example: A Cold Winter with major ice storm. The tower is designed for a wind and ice load. Ice accumulates on the mounting arms, lattice work, antennas, and camouflaged branches etc. This ice in the Loudoun area could be as large as 20 lbs of a chunk. When the sun comes out and the direct rays of the sun hit the tower structure, large chunks of ice and will fall from great height at the point of acceleration of  $32'/\text{sec}^2$ . From 150' at a size of 20 lbs. at the acceleration of  $32'/\text{sec}^2$ . This would cause certain death to a human being.

With the wind slightly blowing that ice could travel out on a trajectory as far as 150'.

Danger Zone is 150' + 15' (10%) = 165' of Fall Zone

### **Important Principles of Communications Towers:**

1. All towers are dangerous for falling objects.
2. All towers should be inspected on an annual basis for structural stability and workmanlike attachments.
3. Structural analysis should be performed by a Structural Engineer every time a new antenna is attached to the tower.
4. Each tower should be insured for Liability of failure or injury of the public.
5. Any future development should not be allowed to encroach within the 110% measurement from the base of the tower.

In summary, a setback of 750' from a residence and 110% from a property line is a standard measurement that most counties use in the placement of communications towers.

### **3. Maximum Permissible Exposure Evaluation**

This report is known as the MPE Evaluation. This evaluation is performed under the Code of Federal Regulations 47 CFR 1.1301 through 1.1319.

This Evaluation is the study of the energy emitted from the antennas selected by the Applicant and the power which the transmitting equipment is set. This study evaluated the Effective Radiated Power or ERP in relationship to Radio waves that fall into two categories: Ionizing and Non-Ionizing.

The Ionizing Radiation does cause harmful effects to the public. These radio frequencies are at the lower frequency levels that many of the newer blocks of frequencies operate.

There are two exposures: Occupational and Public.

Public Exposure is for the public walking outside of the typical compound fenced area.

Occupational Exposure is for the tower and equipment technicians that work on such towers.

Each tower must be calculated and field measured for this exposure. Each tower must post a sign of one of three categories:

***Notice- Blue***  
***Caution- Yellow***  
***Warning- Red***

Recommendation:

**This study should be part of the NEPA report with calculations and the recommended signage for each site.**

The County should reference the Federal Communications Commission bulletin dated June 2, 2000 titled, "A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practice Guidance"

**Important note:**

In the calculation and Field Measurement of the Effective Radiated Power, a "Safe Distance" for the Public is established. This typically is 100 to 200 feet. But could be more if the antenna location closer to the ground level requires a greater buffer. Therefore Setbacks from Residential Structures and the Public falls in line with the Required Setbacks from the first recommendation.

**4. Multiple Towers requested in one (1) application**

**Setting Precedence:**

Allowing multiple towers to be built within the same compound generally should not be permitted. The reason for this not to be allowed is that of Visual Impact and Interference/Modulation,

**Visual Impact:**

The County's stated goal to minimize the number of towers, thereby minimizing the visual impact upon the surrounding area. (Tower Farm view). If precedence is set with multiple towers to a compound, what would prevent an Applicant to apply for a tower farm? One compound 100' wide and 500' feet long with 7 towers within the compound. This is not done in any counties in Virginia and the Ordinance should state one tower per application to be judged on its merits.

**Interference and Modulation:**

Allowing multiple towers to be built within close proximity from a developers knowledge of building speculative towers can cause interference and modulation issues, especially for carriers utilizing the same technology and co-locating on such towers at the same height. Therefore, it is possible that one tower could be utilized fully, while a second tower within the same compound would remain vacant due to possible interference/technical issues, causing logistical problems for a carrier that needs to co-locate in the area to improve its service to the area. That carrier may not have another co-location option, but would the County allow that carrier to construct yet another tower in the vicinity?

**5. Camouflage Technology**

Numerous camouflage techniques exist to disguise wireless telecommunications technology. However, in order to be effective, the particular technique employed

must be of the proper scale and be in harmony with its setting. Techniques used to hide or blend the view of towers and related equipment is frequently referred to as “stealth”. Stealth communications structures are not tower developer’s first choice due to cost and technical limitations.

### **Communications Stealth Flagpoles**

Stealth flagpoles are ideal in recreation and commercial environments. Antennas and cables can be concealed within the cylinder of the flagpole structure.



## **Communications Stealth Silos**

Stealth silos are ideal in agricultural environments with existing farms and where silos are typical structures. An advantage of a silo is that all of the equipment, i.e., antennas, cables, and ground equipment can be installed inside of the silo.



## **Communications Stealth Tree Pole or Monopine**

Best suited for wooded environments, a monopine can blend well and barely be distinguishable from the surrounding foliage. A monopine is designed with a realistic number of branches and rubber tree bark for added texture and dimension.



## **Towers Damaged by High winds, Ice and Overloading**



**Ice Storm Damage**



**Ice Storm Damage**



**Antenna that fell due to ice**



## High wind Damage

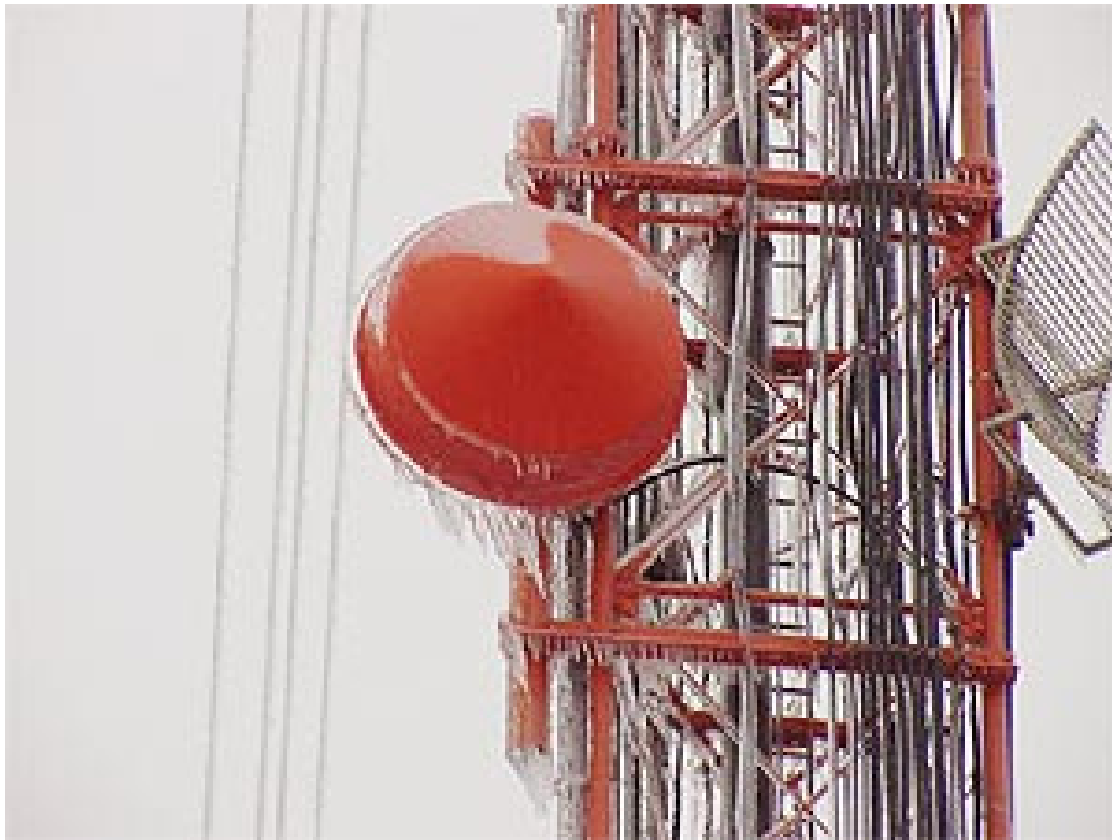


## Notice Residence in background



## Guyed tower





**Ice accumulating on Tower**



**Damage to Adjacent Commercial Building**

## Monopole Tower Failures







## MONOPOLE FAILURE AT BASE

### Industry investigating monopole failures

July 28, 2007 - There have been multiple monopole failures this year such as this Sprint/Nextel monopole that fell in California in early May.

Although some of the structure failures can be attributed to winds in excess of jurisdictional design requirements, some monopoles reportedly failed at wind speeds that should not have caused the poles to collapse.

One commonality is that numerous failures were directly above the base plate or above flange locations.

In an industry where the speed of rumors, misstatements and misunderstandings can make the highest ASCE three-second gust blush with envy, industry observers are quick to fault poor engineering, manufacturing and/or metal fatigue as the usual suspects.



Some structural engineers believe that design aspects of monopole engineering should require a closer look, and the TR14.7 TIA-222 committee agrees since they will be reviewing base plate design methodologies and weld details of the base connection on monopoles. They'll also be investigating fatigue categories on welded joints. Their findings and recommendations will be included in Revision H of the tower standard. However, it could be a year or two until this area of concern is fully explored.



If you or your company can provide any research, structural testing data or photographs of failed monopoles, please send them to [info@wirelessestimotor.com](mailto:info@wirelessestimotor.com) so that we can share this information with the industry.

Monopoles, the structure of choice for most planning and zoning officials, have a life cycle in excess of 50 years when maintained, according to manufacturers, but many of them that were installed during the industry's greatest growth period require retrofitting solutions for additional capacity.





### **MONOPOLE ON FIRE**

**LOCATED NEAR HIGH  
SCHOOL BUS GARAGE**

**BUSES WITH STUDENTS HAD  
TO PARK FURTHER AWAY  
THAN NORMAL FOR SAFETY**

## American Tower 177-foot monopole crippled while being rehabilitated in Michigan

July 24, 2007 - While working on a reinforcement project to add additional capacity to a Howell, Michigan monopole, a contractor accidentally set the structure's transmission lines on fire, causing the American Tower Corporation monopole to be completely destroyed.

The fire, which started at about 9 a.m., burned itself out by 10 a.m., but left a leaning unstable 177-foot telecommunications tower that served AT&T, Sprint, and carried the internet connections for five Howell schools.

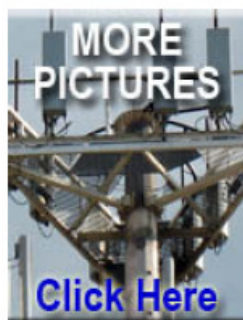
A COW (cell on wheels) is expected be placed in service until a new monopole can be installed.

"AT&T is currently cooperating with local officials and working with the vendor of the structure as they assess the safety of the tower," said AT&T Spokesperson Meghan Roskopf.

Fire officials on site said the project, under the supervision of CommStructures of Pensacola, Florida, required cutting and welding and they believe that the coaxial cable was accidentally set on fire.

Paul Roberts, Vice President of Compliance for American Tower, said there is a very low probability that the tower will topple. He said the steel structure sometimes straightens itself out when it cools following the fire.

"However, we take no chances," Roberts said. "We will keep a 250-foot clearance until we can get a crane out there and it's secured."



The tower is next to the Howell High School bus garage. Buses already parked near the monopole were not in danger, but buses that came in with students had to park farther away than usual to stay out of the way of the fire.

People in a bus garage and those students and teachers in the part of the school complex containing a swimming pool, were evacuated, police said. The school is on Highlander Way, off M-59. No injuries were reported.

